CHAPTER I: INTRODUCTION

With the agricultural production being extremely unsteady affected by geographical and weather conditions and the population growing at a high rate, Bangladesh is in the constant food shortage state. The shortage must be filled with imported foodgrains and this is giving a serious pressure to the national economy. Under such circumstances, the Government of Bangladesh has a policy that, in order to achieve the goal of self-supporting of foodgrains and to stabilize people's life, the Government must enforce various close policies for raising the production enthusiasm by supporting fair prices paid to producers of foodgrains and for stabilization of people's life by conducting fair rationing to consumers, in addition to the basic policies of domestic production increase and securing of foodgrains for emergency use, and the Government concludes that foodgrain storages that are essential for procurement of domostically produced foodgrains, storing and rationing must be established in a better form and greater capacity.

Foodgrain storage construction programme is being promoted by the Ministry of Food mainly, and at present, is established based on the second 5-year plan ending at the 1984/85 fiscal year (one year from July, 1984 to June, 1985). Much portion of the programme has been realized by introducing the foreign aid fund, and the Government of Japan also extended aid on foodgrain storage construction in succession even before tha current 5-year plan. Aid of the Government of Japan was given on construction of 50 storages (50,000 tons) in three phases since the first survey in 1976. The request finally made to the Government of Japan this time is the grant aid for construction of 35 storages (35,000 tons) in CSD and 10 storages (10,000 tons) in LSD, totalling 45 storages (45,000 tons).

In order to study justifiability of the foodgrain storage construction under the requested grant aid, the Government of Japan determined to dispatch a study team for basic design of the storages, through the Japan International Cooperation Agency (JICA). The purposes of dispatching the study team are as follows:

(1) Confirmation of the request from the Government of Bangladesh.

(2) Confirmation of the contents of the Government of Bangladesh foodgrain storage construction programme, survey of the requested project sites, and study of justifiability of constructing the requested number of foodgrain storages.

(3) Survey of utilizing condition of foodgrain storages in Bangladesh, including those that were constructed on the grant aid of the Government of Japan, and survey of current situation of foodgrain storage construction, and proposition of a storage design optimum to the current situation and study of its justifiability.

(4) Survey of the requested construction sites, preparation of a project plan matching to the present conditions of the sites, and study of its justifiability.

To accomplish the aforementioned objectives, a study team, including specialists on foodgrain distribution and architecture design and structure, conducted surveys in Bangladesh during the period of April 8 to April 24, 1982. The study team engaged in the survey works of collection and hearing of necessary information related to foodgrain distribution and storage construction, reconnaisance of the requested sites in the Tejgaon CSD, Mymensingh CSD and Muladuli CSD among the scheduled construction sites that had been requested, and discussion with related parties mainly from the Ministry of Food (refer to Appendix I). The officials of the Government of Bangladesh and the team members discussed on the survey results, mutually confirmed such matters as the purpose of foodgrain storage construction, final request on construction sites and number of storages to be built, conditions for construction site selection, storage design conditions, and items to be done by the Bangladesh government for implementation of the project, and the two parties exchanged the Minutes of Discussion containing all these subjects (refer to Appendix II).

In order to fulfill the aforementioned purposes, the study team reviewed the utilizing conditions of foodgrain storages including those built under grant aid of the Japanese government and the additional

storage construction programme based on the foodgrain supply/demand situation in Bangladesh, current situation of foodgrain storage construction under foreign aid including Japanese aid and technical data related to these storages, and the current situation of the requested construction sites. A storage design and project plan are prepared based on these review results for the purpose of answering the Bangladesh government request. This report is prepared outlining the reviews of the study results and proposing the storage design and project plan, as well as reviewing and reporting justifiability in each item of the study objective to fulfil the predetermined purposes.

CHAPTER II: BACKGROUND

1. Foodgrain Storage Conditions

1-1 Outline of Food Supply/Demand

1-1-1 Production and Government Procurement of Food

Bangladesh is located in the subtropical zone of from 20° to 26° of the north latitude and the majority of the land is the flat plain formed by the sedimentation in the estuaries of Ganges, Jamuna and Meghna rivers. Therefore, rice can be cropped any time through the year if water can be managed properly on the irrigation and drainage.

However, in Bangladesh, about 80% of the annual rainfall concentrates in the rainy season of June through October and there is hardly any rainfall in the dry season of November through February. Therefore, in the rainy season majority of the land, especially in the southwestern low marsh, is under water adding the water of large rivers from the neighboring countries in the upriver region and in the dry season comparatively high region are extremely dried up, and in either case the rice cropping is impossible. The range where rice cropping is impossible varies by the weather conditions each year.

Accordingly, rice is cropped only when water necessary for cultivation is available. The types of rice that are planted are Boro (harvesting in April/May), Aus (harvesting in April through June) and Aman (harvesting in November/December) but it is usual that expected crop is affected by the weather conditions during the growing period and at the time of harvest.

Among the three types, the Aman rice that is harvested at a time of steady weather is good in the quality and the crop amount is comparatively steady. Therefore, the Aman rice is the mainstream of rice cultivation, and its production accounts for about 60% of the total.

Since water is not required for cultivation as much as rice does, cultivation of wheat is rapidly increasing in the northwestern

region, but the wheat production has reached about 10% of the rice production yet.

To accomplish the goal of food self-supply, the Government of Bangladesh is making effort in improvement of agricultural infrastructures such as food plant breeding and irrigation, drainage and rice cleaning facilities on one hand and, at the same time, is enforcing the policy of maintaining adequate producer prices to raise production enthusiasm among the farmers. However, since rice, which is the main item of domestic farming, is too dependent on the weather conditions, the Government has not been sufficiently rewarded for the effort. In spite of these difficulties, owing to improvement of drying and rice cleaning facilities and techniques, government procurement of the Aus and Boro rices, which has been scarcely procured before, is increasing and wheat production is increasing at a high rate, both of which are certainly promising developments.

Domestic production and government procurement of food in recent years are shown in Tables II-1 and II-2. In 1980/81, the country had comparatively favorable weather and the production recorded 14.6 million tons and government procurement 1.02 million tons. In 1981/82, however, drop of the production to the previous level of 12 million tons is anticipated because of drought.

1-1-2 Rationing and Import of Food

For stabilization of people's life, the Government of Bangladesh has established the Statutory Rationing System for complete distribution of food in major cities and in areas where food is not supplied adequately and the Modified Rationing System for the poor in areas where food is rather easily available, that is, farming villages.

The amount of food that the Government must procure to execute the rationing systems varies each year since the necessary amount of food for rationing in farming areas fluctuates by the production situation each year. Generally, however, the fixed consumption mainly in major cities like Dacca, Chittagong, Khulna, Rajshahi, etc.

is estimated to exceed 1.5 million tons. If this is added with the amount necessary for rationing in farming areas, the government needs average 2 million tons a year.

Among the amount that the Government must procure for rationing, whatever that cannot be managed by the government procurement (0.4 to 0.6 million tons) of domestic food must be imported from abroad. Therefore, food of more than a million tons is being imported every year, and especially in 1979/80 when the domestic foodgrain production was extremely poor, an amount exceeding 2.7 million tons was imported.

Food import condition in recent years is shown in Table II-5.

1-1-3 Trend of Food Supply/Demand

The nation scale food supply/demand trend and governmental supply/demand trend in Bangladesh are shown in Table II-6 and II-5, respectively

1-1-4 Distribution and Transportation of Foodgrains

Domestic foodgrains are mostly procured through inspection at LSD (Local Supply Depot) or TPC (Temporary Purchasing Center), to which nearby farmers bring in their products, but some amounts are bought through commission merchants or through CSD (Central Storage Depot).

The domestic foodgrain procured by the Government are sent to the nearest CSD from LSD (or TPC) and collectively stored in, or sent to the other CSD. When necessary, they are distributed to the LSDs in the vicinity and issued for rationing. (In case they are in the state of paddy, they are processed into parboiled rice or milled rice.)

In the case of imported foodgrain, foodgrains unloaded from boats are stored in CSDs or silos in the harbor district, or transhipped from the boat to barges, landed to silos or CSDs alongside rivers and then transported to inland CSDs or LSDs for storage and ultimate rationing. These distribution routes are illustrated in FIG. II-1.

Railway, trucks by road, barges by river are available for movement of these foodgrains and the most rational transportation means is selected each time.

Sales for food rationing are conducted in CSDs or LSDs to licenced dealers who ultimately distribute to the consumers. The Government sales prices to licenced dealers (wholesale prices) and the sales prices from licenced dealers to consumers (retail prices) are announced by the Government, and recent trend of these prices are shown in Table II-8 as well as procurement prices in Table II-7.

The actual conditions of foodgrain distribution through open markets could not be studied.

1-2 Present Conditions of Foodgrain Storage

1-2-1 Role of Foodgrain Storage

To procure (import), transport, store and ration the food steadily and smoothly, storages having the facilities and capacity to meet the need are essential in such adequate districts as procuring area, importing port, consuming area and collecting distributing area. If they are not properly organized, the procured foodgrains are subjected to loss caused by birds and rats and the quality of the foodgrains cannot maintained without being degraded by mold.

1-2-2 Present Conditions of Foodgrain Storage

(1) Existing capacity of storages

Table II-9 shows the existing capacity of foodgrain storage as of end December, 1981.

(2) Additional storage construction programme by Ministry of Food

Table II-10 shows the additional storage construction programme by districts that the Ministry of Food has policy to complete by the end of fiscal year of 1984/85. The results of trial calculations made by the study team for the existing storage

capacity and additional storage requirement as necessary for realizing the programme are given in Table II-11 for reference.

1-3 CSD and LSD and Control System of Food Distribution

In Bangladesh, all foodgrain storages belong to the Government and are located in CSD (Central Storage Depot), LSD (Local Supply Depot), TPC (Temporary Purchasing Center) and Silo. Historical review of them indicates that CSD was established in consumption areas for the purpose of storing food and LSD was established in producing areas for the purpose of procurement operation. Therefore, the responsible officer in the central government on CSD is the Director of Movement and Storage and that on LSD is the Director of Supply, Distribution and Rationing (refer to FIG. II-2).

However, the Government policy has been changing since 1974, and nowadays the distinction between CSD and LSD is becoming obscure gradually. At present, the roles of these storages as viewed from the standpoint of food (mainly foodgrains) distribution are as follows (refer to FIG. II-1).

(1) CSD

CSDs are established in food consumption area of food or in key-point of collection and distribution of food. CSD receives food from LSDs and the other CSDs in the neighboring areas, stores it, and issues it for rationing in the district and for transporting it to the other CSDs and LSDs. CSD also purchases (receives) food from farmers in the neighborhood.

(2) LSD

LSDs are located in producing areas of food and receives domestically produced food which is procured from farmers and sent from TPC and send it to CSDs. LSDs also issue imported food received from CSD for rationing.

(3) TPC

TPCs are engaged in only temporary procurement of food. It can be established temporarily during procurement seasons of food, and the procured food is not stored but sent out to CSDs and LSDs immediately.

(4) Silo

The role of silos is to receive and store imported unsacked foodgrains. It also functions to distribute foodgrains after sacked.

FIG. II-2 shows that organization chart of foodgrain storages and food distribution. The Directorate of Food in the Ministry of Food controls the entire foodgrain storages and food distribution. The Directorate of Food has six main duties of (1) Supply, Distribution and Rationing, (2) Movement and Storage, (3) Procurement, (4) Inspection Control and Training, (5) Silo, and (6) Accounts. The following describes the control system of CSDs and LSDs.

(a) CSD

CSD is placed under control of the Director of Movement and Storage of the Ministry of Food. The Storage and Movement Officer (SMO) is responsible for running a whole CSD and under him Chief Inspector of Food (C.I.), Inspector of Food (I), Sub-Inspector (S.I.) and Assistant Sub-Inspector (A.S.I.) are engaged in management of a depot. S.I. takes charge of individual storage.

(b) LSD

LSD is placed under control of the Director of Supply, Distribution and Rationing of the Ministry of Food. The Inspector is responsible for a whole LSD having about 20 storages. Dinajpur LSD and Ishurdi LSD are managed by the Chief Inspectors as exception. LSD smaller than that in number of storages is managed by the Sub-Inspector of Food.

Works related to food distribution is controled separatedly from the control of CSDs and LSDs as above mentioned, as explained in the followings.

(i) Procurement

Procurement is controled by the Director of Procurement of the Ministry of Food. Actual procurement work is conducted under the responsibility of the District Controller of Food.

(ii) Inspection

Officers of the central government directly inspect procured food under the management of the Director of Inspection Control and Training of the Ministry of Food. Under such system, the Chief Inspector, Inspector, Sub-Inspector and Assistant Inspector of CSDs and LSDs attend to management of the storages rather than to inspection of food.

For each operation of Procurement and Supply, Distribution and Rationing, and Movement and Storage, a programme is prepared in each administrative area. Each Sub-Division (administrative area consisting of 8 to 9 Thanas, each of which is the smallest administrative area) is controlled by the Sub-Divisional Controller of Food, and the District (administrative area consisting of several Sub-Divisions) is controlled by the District Controller of Food. Each Region administrative area consisting of 4 or 5 Districts is controlled by the Regional Controller of Food.

The Directorate of Food controls distribution of food throughout the country.

FIG. II-3 shows the organization of Directorate in the Central Government for movement and storage of food.

In addition to the above, there are the following officers having particular duties in particular cities other than the officers as above mentioned (refer to FIG. II-3):

Controller of Movement and Storage: 2 officers stationed in Chittagong and Khulna

Movement Officer: 3 officers stationed in Dacca, Chittagong and Khulna

Receipt and Dispatch Officer: 3 officers stationed in Narayanganj, Khulna and Santahar

Thus, the control system of foodgrain storages and food distribution may be very complicated. No simple distinction can be recognized as CSD being the central storage located in consumption area and in keypoint of collection and distribution of food and LSD being the local storage for receiving and dispatching food in production area of food. The two are not controlled within the same control system. Therefore, in order to realize that all constructed foodgrain storages function sufficiently, the foodgrain storage construction programme must be studied based on full comprehension of the total food distribution system, including control of storages, not limiting the subject to the matter of surplus or shortage of storing capacity.

2. Outline of Foodgrain Storage Construction

2-1 Additional Storage Construction Programme of the Government of Bangladesh

The additional storage construction programme prepared by the Ministry of Food indicates that the Bangladesh government must have a stock of 1.576 million tons of foodgrains in the whole country by the end of 1984/85 fiscal year (June 30, 1985) to secure food for the people (refer to Column-b of Table II-10). This food security programme is established as a food policy in the second 5-year plan (1980/81 - 1984/85).

At the same time, the storage capacity needed for distribution is estimated to reach 0.928 million tons in the whole country by the end of 1984/85 fiscal year (refer to Column-c of Table II-10). Accordingly, the total required capacity of foodgrain storage by the end of 1984/85 fiscal year as planned in the additional storage construction programme is 2.504 million tons in the whole country, which is the sum of the required storage capacity for food security (1.576 million tons) and the required storage capacity for distribution (0.928 million tongs) (refer to Column-d of Table II-10).

The total storage capacity of the existing foodgrain storages and the foodgrain storages to be constructed by the end of 1982/83 fiscal year is scheduled to reach about 1.859 million tons in the whole country, and during the succeeding two years until the end of 1984/85 fiscal year, the further foodgrain storages of capacity of about 0.645 million tons must be added in the whole country (refer to Columns-a and-c of Table II-10). For this additional requirement, the Government of Bangladesh has a construction plan under loans from the International Development Association (IDA, or called the Second World Bank) and Asian Development Bank (ADB) and under aid from the foreign governments in addition to the fund that the Government of Bangladesh raises out of their own budget. It can be understood that the request to the aid by the Government of Japan in this time is a part of the plan to raise the resources for additional storage construction programme.

The following plans are being realized, in addition to constructing new storages in new sites accoridng to the additional storage construction programme:

(a) Rehabilitation of existing storages

(b) Reconstruction of existing storages

Construction of foodgrain storages started in the 1950s. Presently about 30 years later, many of the early storages are becoming too decrepit, and the government considers that they will be able to reduce the loss of food during storage in the rehabilitated or reconstructed storages, storing efficiency of which are improved compared with the existing old decrepit storages, resulting in actual increase of food supply, or the new storages can be built in more benefitable location for utilizing storages and land in depots. These plans are not always realized under a programme, but will be important at present when acquisition of new premises for storage construction is becoming difficult.

At present, rehabilitation programme of existing storages is actually being implemented under a total budget of TK151,000,000 (about ¥1,900 million) with the aid from the United Kingdom. Also, their own fund amounting to TK14,000,000 (about ¥177 million) is calculated into the national budget, among parts of foodgrain storage construction project under IDA credit, for rehabilitation of existing storages. In addition, new loans for construction of foodgrain storages from IDA is scheduled in August of this year, and a part of this new loan will be spent for rehabilitation of existing storages.

Some of existing storage have been reconstructed under the aid from the Japanese government. The TWIN-NISSEN type storage (as shown in the title-page photos of this report) is twin-semicircular shape and prefabricated storage of corrugated steel plates and the storing conditions are extremely poor. Therefore some of TWIN-NISSEN type storage can be planned to be reconstructed. Storages of this type were built in the earliest stage of CSDs which have been having the most important sole for food distribution. Principally, CSDs were constructed in very advantageous functional layouts by directly facing railways and roads.

Therefore, it is considered that reconstruction of these storages will have unfathomly important effect that cannot be evaluated with mere figures of storing capacity increase.

2-2 Foodgrain Storage Construction by Foreign Aid

2-2-1 Foreign Aid for Construction Programme

Parts of the foodgrain storage construction fund are prepared on loans from IDA and ADB and aid fund from foreign governments. These loans and aid fund are not always used directly for construction fund, and therefore the detail of items for the loan or the aid are described in II, 2-2-2.

The following is the list of organizations or foreign countries that are offering any amount of aid to the total fund on the foodgrain storages construction that are being implemented as of April, 1982 (to be completed by the end of December, 1982).

IDA	165,000 tons
ADB	62,500 tons
EC	48,000 tons
Denmark	14,000 tons
(sub-total)	289,500 tons
Government of Bangladesh	234,000 tons
Total	523,500 tons

(Source: Ministry of Food)

The above list indicates that foreign resources from international financing organization or foreign country governments are used on construction of 55.3% of the total storage construction. (the other breakdown of fund sources for the construction plan utilizing foreign resources to be completed by the end of the 1982/83 fiscal year, which is listed in Table II-12 is slightly different from the above.) Breakdown of fund sources on storages being constructed as of February, 1981 is shown in Table II-13. At the time, storages in the total capacity of 597,500 tons were being constructed (in

addition salt storages for 80,000 tons were being constructed). Foreign resources were being used for 397,300 tons, equivalent to 66.5% of the total 597,500 tons.

Foodgrain storage construction under foreign aid is conducted according to the required capacity of construction in the additional storage construction programme described in II, 2-1.

2-2-2 Contents of Foodgrain Storage Construction Project under Foreign Aid

The contents of foodgrain storage construction projects under foreign aid are summarized in Table II-14, on the basis of the contents of the Project Proforma that is prepared by the Bangladesh government when a project is planned.

The following points have to be noted with regard to the contents of these projects (refer to Table II-14):

1) IDA and Netherlands projects are revised projects. The revised budgets were added by 28.3% and 90.8% to the total amount of original IDA and Netherlands projects, respectively (refer to Columns-a and-b).

2) The ratio of the amount of foreign aid against the total amount of the project varies. They are 16.0% in the case of IDA project, 28.2% in the case of ADB, 32.5% in the case of EC, 97.8% (not definite yet) in the case of Netherlands, and 9.8% in the case of CIDA (Canada) (refer to Columns-a and-b).

3) Type of storage to be constructed is mostly 500 tons Dacca-type (refer to Column-d).

4) The construction sites are mostly LSDs and cover all over the country (refer to Columns-d and-e).

5) The object items of some of projects involve not only new construction of storages but rehabilitation of existing facilities, construction and improvement of ancillary facilities, supply of equipment and materials (refer to Column-f)

6) The objective items for aid varies. One involves consultation and training only (CIDA), and another supply of materials and consultation only (C), and some involve new construction of storage, construction and improvement of ancillary facilities, supply of equipment and materials, and consultation (IDA and ADB) (refer to Column-g).

2-2-3 Method of Foodgrain storage Construction under Foreign Aid

Table II-15 shows the methods of foodgrain storage construction quoted from the Project Proforma (IDA, ADB, EC, Netherlands and CIDA, Canada). The following points should be noted from these contents.

(1) Consultant

On the engineering for project except the CIDA (Canada) project, a plurality of Bangladesh consultants for every project are engaged in such different items as tender documents preparation and tender evaluation, etc.

(2) Designs and specifications

For all the projects, designs and specifications are to be in accordance with PWD. (EC and CIDA project details are unknown.) Therefore, the construction cost are based on the PWD cost estimate.

(3) Construction engineers

On all the projects other than the ADB project, PECU (Project Engineering Construction Unit of PWD) supervises the construction. (The EC project condition is unknown.)

(4) Construction contractors

For all the projects, all construction contractors are Bangladesh firms. A plurality of contractors for every project are engaged in the different construction from one another by construction item and construction site, etc.

(5) Contracting type

For all the projects a pluality of contractors are relected

through tenders, and awarded contracts, as explained in (4). Threrefore all contracts are not turn-key type.

(6) Procurement of equipment and materials

On all the projects other than EC project, equipment and materials are procured in Bangladesh. Construction machineries and materials are also contracted with a plurality of firms through tenders for each item and construction site.

(7) Construction period

The construction period varies by the project. In IDA and Netherlands projects, the construction work was delayed, and these plans were revised at later dates for additional construction fund.

2-3 PWD Design and Specifications

2-3-1 Present Conditions and Problems on Foodgrain Storages Design

The following organization in the Government of Bangladesh control the construction of food storages:

PWD - Public Works Department, Ministry of Public Works and Urban Development

PIW - Project Implementation Wing, Ministry of Agriculture and Forest

MOLGRD - Ministry of Local Government, Rural Development and Co-operatives

Also, as described in II, 2-2, foreign resources are introduced, in addition to their own fund, to construct food storages. Under the circumstances, the storage type and construction conditions are determined differently by the aforementioned construction supervision organizations. Also, in the case of storage construction under foreign aid, the PWD standards for designs and specifications are usually used, but as described in II, 2-2, the objective items and construction methods are different by the project. Accordingly, it is extremely difficult for the Government of Bangladesh to understand the actual situation of food storage construction and this has been causing

trouble to the Government of Bangladesh when it prepares exact construction programmes. In order to solve this problem, the Government of Bangladesh adopted and clarified the following three policies as the principles of storage construction:

1) Standardization of design (The Dacca type storages of 500 and 1,000 ton capacities in the PWD designs and specifications)
2) Standardization of construction costs (To be realized by standardizing the design and specifications)
3) Construction of storages in accordance with the food storages construction programme of the Government of Bangladesh

The foodgrain storage construction plan to be realized under the Japanese aid must be prepared in accordance with the aforementioned policies.

2-3-2 Design and Specifications

The following outlines the PWD design and specifications that the Government of Bangladesh adopts as the standard type of foodgrain storage. In the outline, the design for the Dacca type storage of 1,000-ton capacity only is reported as follows (refer to FIG. II-4).

(1) Dimensions

Floor area:		100 ft x 80 ft (about 743.2 m^2)
Height:	from ground to floor top	3 ft (about 0.914 m)
	from floor top to roof slab bottom	19 ft (about 5.789 m)
	from gound to roof slab top	22 ft & 4-1/2 inches (about 6.818 m)

(2) Structure

Foundation	Reinforced concrete independent footing at the bottom of posts
	Reinforced concrete foundation beam
	Brick independent stepped wall footing

Post and beam	Reinforced concrete
Roof slab	- do -
Floor slab	Reinforced concrete on ground
Wall	Brick

(3) Finish

Roof	Lime terracing (3 - 7 inches thick)
Exterior	Mortor water-soluble paint
Interior	- do -
Floor	Trowelled concrete finish with expansion joint
Ceiling	Mortar, water-soluble paint

(4) Quality control

Damp proof	Polyethylene sheet under the floor slab
Ventilation	Window
Air-tight	Not considered in window or door
Timber dunnage	Installed

(5) Criteria for sturctural analysis

Concrete compression strength (28 days):	fc = 2,000 psi (about 140 kg/cm^2)
Tensile strength of mild steel bar (MS):	fs = 18,000 psi (about 1.265 kg/cm^2)
Bearing capacity of soil:	1,680 lbs/sft (about 8.2 tons/m^2)

The table "Comparison of Foodgrain Storage Design" in IV, 3-2 refer to comparison of the design criteria adopted under the previous Japanese grant assistance to those for this project.

2-3-3 Construction Budget

The construction cost estimated by PWD is usually used as the base for the budget for storage construction in the Ministry of Food.

The construction cost is calculated based on the schedule of Rate periodically published by PWD. The following are set as the items of cost estimate for storage construction:

(a)	Direct construction cost	
(b)	Cost for additional construction and/or installation	
(c)	Work establishment charge	{(a) + (b)} x %
(d)	Departmental charge	{(a) + (b)} x %
(e)	Contingency	{(a) + (b)} x %
(f)	Escalation	{(a) + (b) + (c) + (d) + (e)} x %

The total of above items of (a) through (f) are estimated as the construction cost. However, Item (a) covers the costs of the building construction and finishing. Other costs for electrification, water supply/drainage, ventilation equipment and dunnage are separately calculated from (a). (In the above list, these are temporarily listed as Item (b).) Also, Item (f) may not be added sometimes.

The construction budget is calculated as in the above. Also, since the items of project, the items under aid and the method of construction are different for each project under the foreign aid, the following points must be noted when comparing construction budgets:

1) The project items included in the cost estimate and the specifications of construction included in the project must be checked.

2) On review of a construction budget on which the work has already started, the work progress and actual expenditures must be checked and the period and budget for the remaining work are revised and check is made on the construction period and expenses as the final results.

3) The actual period for comparison must be checked and an adequate revision is made on the escalation for the corresponding period, and check is made on the construction period and expenses as the final results.

3. Present Condition of Storages Constructed under Japanese Aid

3-1 Short History of Storage Construction

The aid fo the Government of Japan to foodgrain storage construction in Bangladesh started at the basic design study by the study team dispatched by the Japanese government during the period of December 6 through 19, 1976. Based on the basic design study report, a Japanese contractor constructed 15 storages (1,000-ton capacity) during the period from October, 1977 to December, 1978. The construction sites and number of storages are as shown below:

Maheswarpasha CSD (Khulna)	11 units
Halishhar CSD (Chittagong)	2 units
Dewanhat CSD (Chittagong)	2 units
Total	15 units

The second phase storage construction was started at the basic design study performed during the period of November 13 through December 9, 1978. The basic design study report was submitted in March, 1979. As same as in the first phase, a Japanese contractor was engaged in the construction, and the following 23 storages (1,000-ton capacity) were constructed during the period of September, 1979 through March, 1981:

Santahar CSD (Bogra)	5 units
Boyra CSD (Khulna)	13 units
Halishhar CSD (Chittagong)	5 units
Total	23 units

The third phase storage construction was more for meeting the portion that was not realized by the first and second phase of foodgrain storage construction. No new study was made especially for the third phase and a construction plan was prepared based on the study results for the first and second phases. In the third phase, again a Japanese contractor constructed 12 storages (1,000-ton capacity), as shown below, during the period of September, 1980 through October, 1981:

Santahar CSD (Bogra)	6 units
Tejgaon CSD (Dacca)	6 units
Total	12 units

This is the short history of foodgrain storage construction under the Japanese aid. While the construction was divided into three phases, the construction plans were made according to the same design policy as prepared for the first phase construction. 13 storages in Boyra CSD (Khulna) of the second phase and 6 storages in Tejgaon CSD (Dacca) of the third phase were constructed in place of the old TWIN-NISSEN type storages as explained in II, 2-1.

Five years have passed since the start of the first stage, and as described earlier in this report, the conditions of food distribution has changed during the period, resulting in changes of the foodgrain storage construction programme by the Government of Bangladesh, the contents of projects under foreign aid and the design and specifications of storage. This report has to be understood with thorough understanding of these circumstances.

3-2 Utilizing Conditions of Storages

As examples of utilizing conditions of storages built under the aid of the Japanese government, Tables II-16 and II-17 are prepared showing the stock position on the survey days at Halishahar CSD (April 17, 1982) and Tejgaon CSD (April 18, 1982), respectively.

In Table II-16 of Halishahar CSD, rice and wheat were stored in 7 storages (7,000 tons) and the total stock was 3,746 tons on the survey day, equivalent to 53.5% of the total capacity of 7 storages. Stock position of the entire Halishahar CSD at the time was 28,692 tons as the total of 23,961 tons of rice, 1,710 tons of paddy and 3,021 tons of wheat as shown in Table III-3. This stock position is 41.2% of the total capacity of entire CSD, which is 69,700 tons (in addition there is a storage capacity of 6,540 tons of the salt storage).

In Table II-17 of Tejgaon CSD, the stored items on the survey day were rice, paddy, wheat and sugar, and the total stock of the

foodgrains at that time was 3,408 tons. This is equivalent to 56.8 % of the 6-storage capacity (6,000 tons). At that time, the total stock of entire Tejgaon CSD was 24,535 tons as the total of 19,509 tons of rice, 1,723 tons of paddy and 3,303 tons of wheat. Since the total cpaacity of the CSD is 35,600 tons, the stock ratio only for foodgrains is 68.9%. In addition to foodgrains, Tejgaon CSD stored salt, sugar and oil and when these items are calculated, the stock ratio of storages constructed under Japanese aid becomes slightly larger (59.5% when sugar is included), but on the other hand the stock ratio of the entire CSD was estimated to be over 72% (refer to Table III-3 for stocks of the entire CSD). Since the storages constructed under the Japanese aid do not face the railroad tracks, it seems that smaller stock ratio than the storages facing the railroad tracks these is caused by the inconvenience in issue and receipt.

3-3 Stock Control and Quality Control

The following describes the stock control in storages constructed under the Japanese aid, using an example of Tejgaon CSD.

1) Sacked foodgrains are piled up to about 17 layers (about 3.0 to 3.5 m high for storage. When necessary, they may be piled up to 21 layers temporarily (about 4.0 to 4.5 m high). They are not piled up any higher than that since it involves technical danger.

2) Windows and doors are kept open ordinarily for better ventilation. (The windows and doors are equipped with nets or grids for prevention of insect and robbery.) In the rainy season, the windows and doors are closed for prevension of humidity.

3) Fumigating is conducted periodically. There are two methods in fumigating; one is fumigating of each entire storage with all openings of the storage completely sealed and the other is fumigating of each stock lot by covering the lot with a vinyl sheet. Fumigating is most effective when the second method is applied. It has been quanititatively

measured that the storages built under the Japanese aid has a higher airtightness and accordingly fumigating in the Japanese storage in the first method is as effective as 40% of the second method. (In other storages, the fumigating effect in the first method is only about 15% of the first method.)

4) The principle of first-in, first-out is adopted. The average length of storing period was 2 to 3 months at the time of survey. The period is several weeks at the peak of in and out.

5) While these storages are not restricted to store foodgrains only, foodgrains are given with the top priority. Other items, sugar for example, are stored also.

The interest in the storing efficiency of storages is rising among the Government of Bangladesh. The quantitative measurement of fumigating effect, described in Item (3) of the above was conducted by the expert dispatched by the World Bank (WB/IDA). The expert measured gas leakage through openings of the storage buildings such as windows and doors and through walls, roofs and floors for a certain length of time. After comparing results of the other kind of storages the expert reported that the storages constructed under the Japanese aid have the highest performance and he recommended adoption of the specifications of the storages constructed under the Japanese aid for all storages to be newly constructed under the Japanese aid. Quantitative measurement of the other storing efficiency as conducted by the expert is not easy in actuality. However, it certainly is possible to keep records of loss of stocks in the usual storing conditions, consumption of fumigating chemicals, or general maintenance expenses of storages for constant comparison.

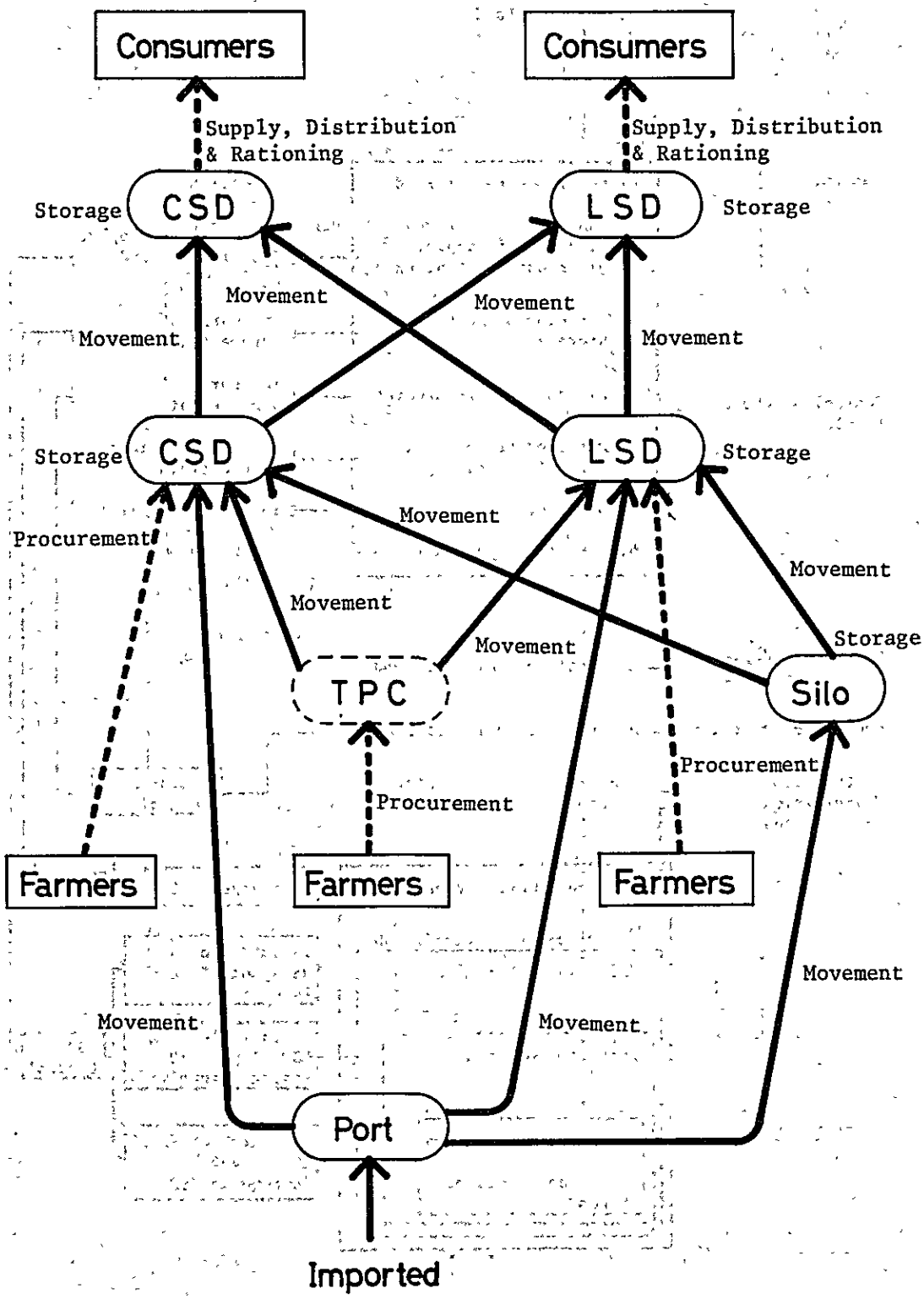


FIG. II-1 Diagram of Procurement, Storage & Movement of Foodgrain

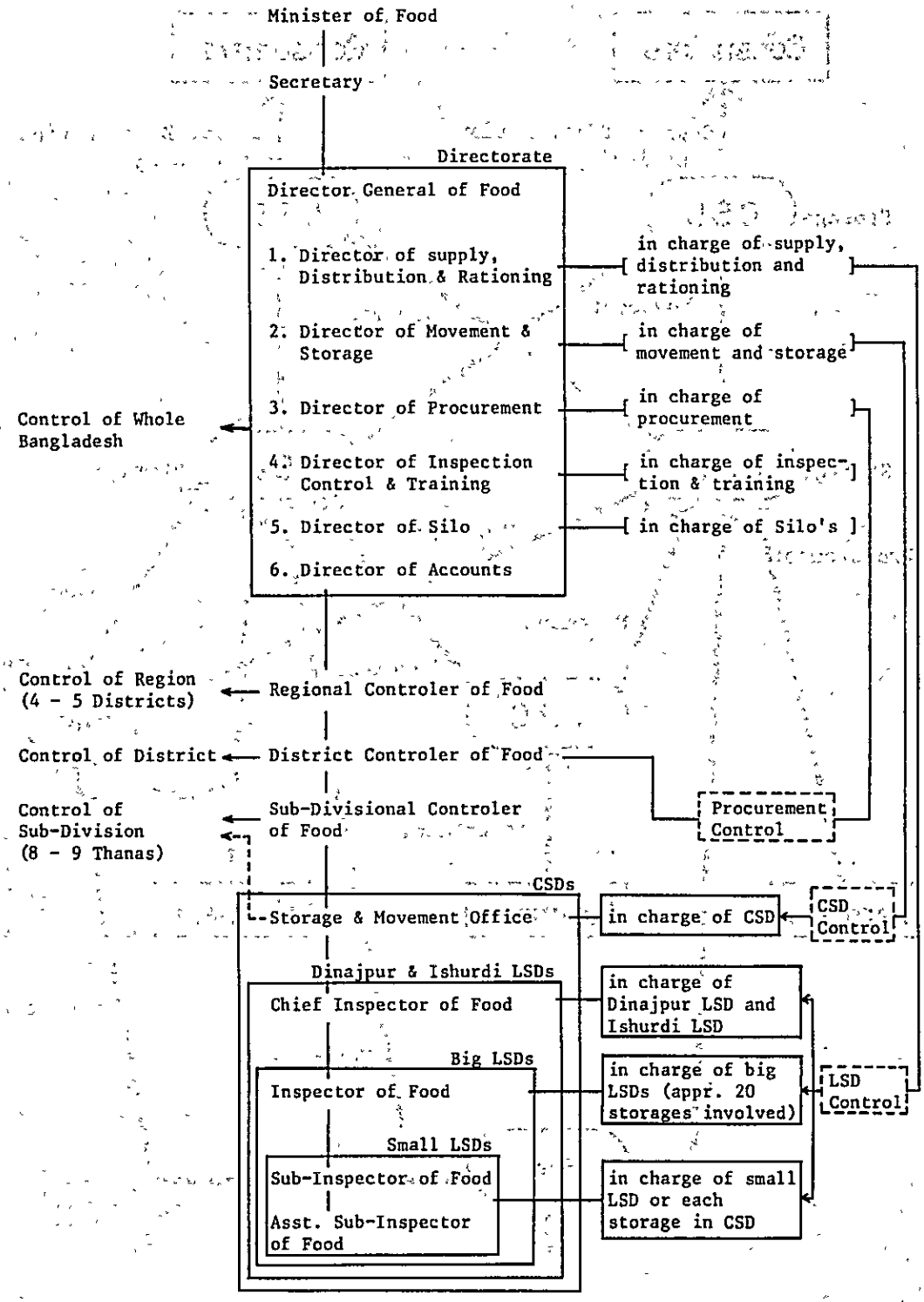


FIG. II-2 Organization Chart for Control of CSDs and LSDs

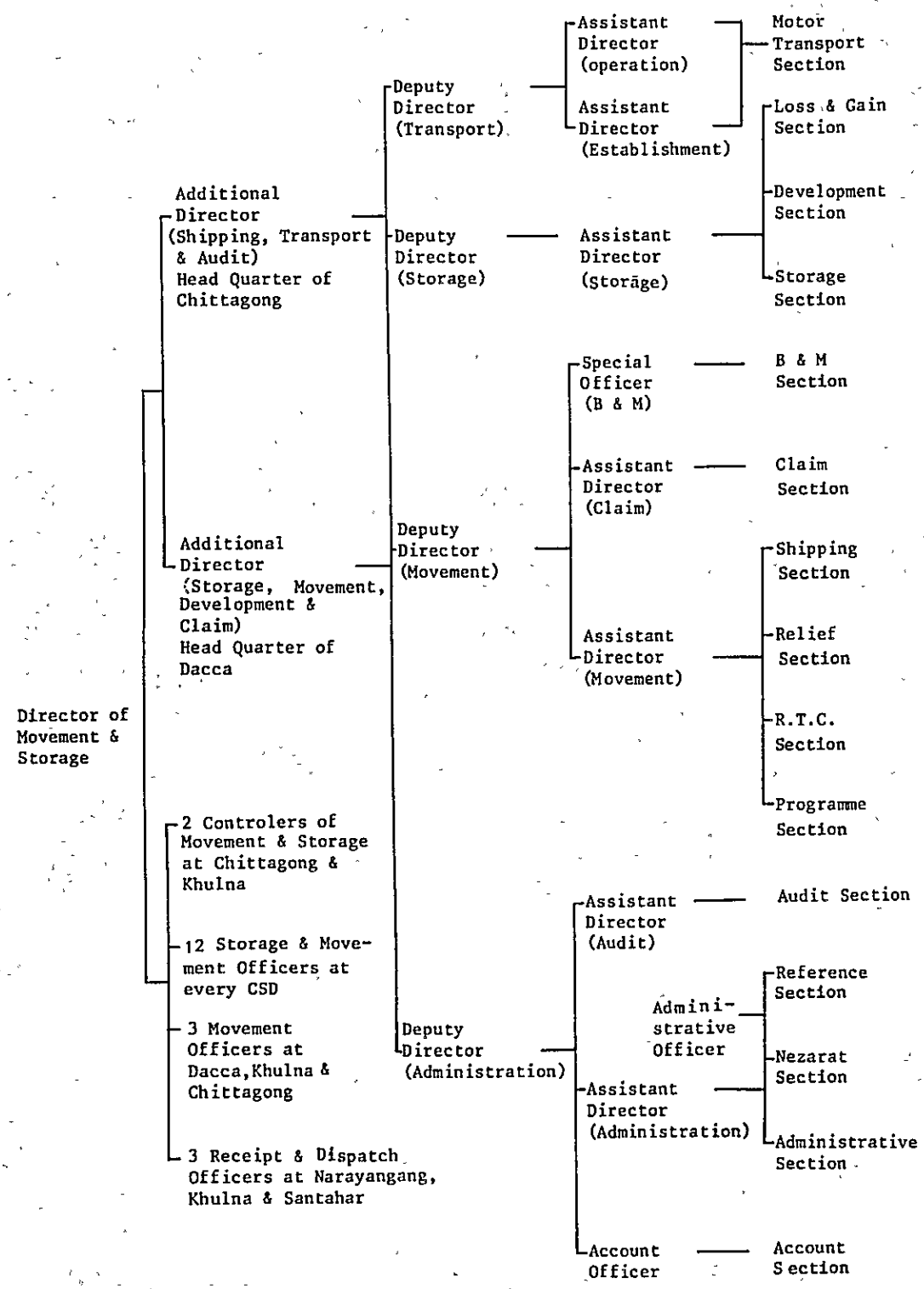
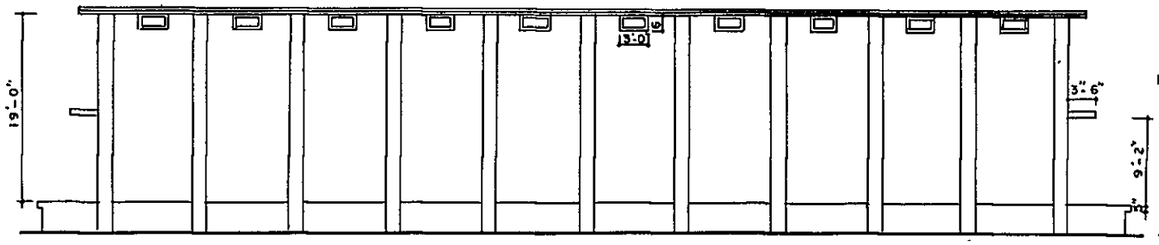
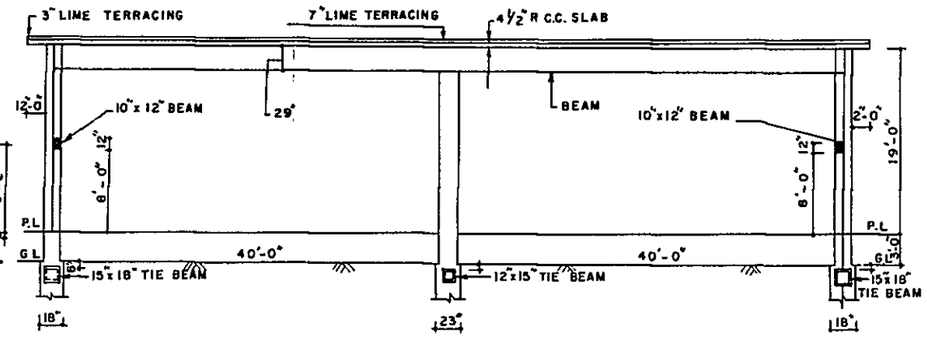


FIG. II-3 Organization Chart of Directorate of Movement and Storage

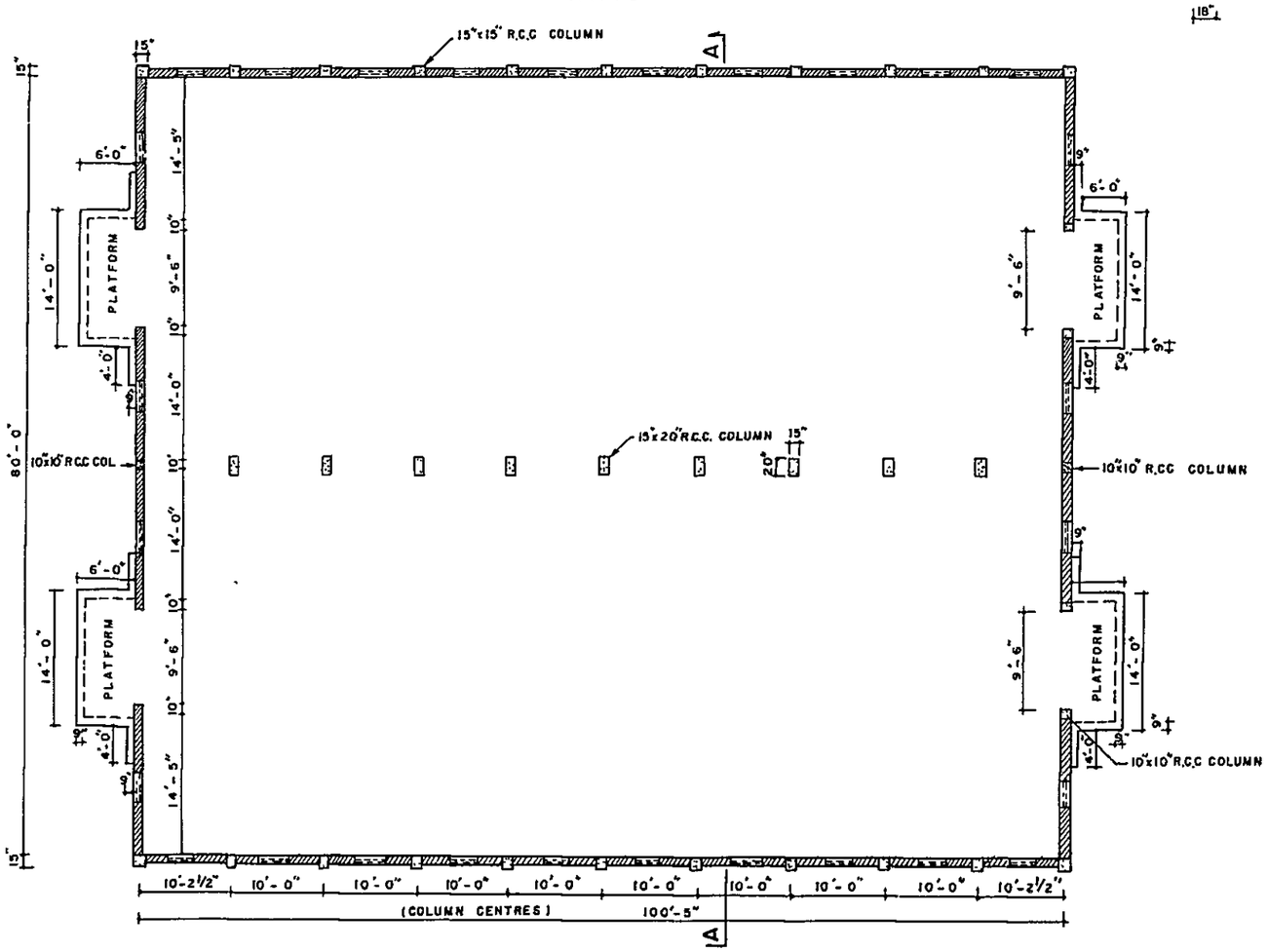


ELEVATION



SECTION A-A

SCALE; 1/8" = 1'-0"



PLAN

FIG. II-4

OFFICE OF THE EXECUTIVE ENGINEER P.W.D. DESIGN DIVISION II DACCA				
SCALE AS SHOWN	DRAWING NO C.P.F.G/131/81	DATE 18-8-81	DRAWN BY MAHMUD ALI	TRACED BY MAHMUD ALI
SHEET NO 1 2 3 4 5 6 7 8	PROJECT TITLE:- MODIFIED 1000 TONS CAPACITY DACCA TYPE FOOD STORAGE GODOWN (HAVING 19'-0" PLINTH TO CEILING HEIGHT)			ARCHITECTS DRG. NO
	DRAWING TITLE:- PLAN . ELEVATION & SECTION			DATE
MD. NURUL ISLAM ASSISTANT ENGINEER P.W.D. DESIGN DIVISION II DACCA	S.M. RAHAN 18/8/81 EXECUTIVE ENGINEER PWD DESIGN DIVISION II DACCA		MD WALIUL ISLAM SUPERINTENDING ENGINEER P.W.D. DESIGN CIRCLE DACCA	

Table II-1 Rice Production and Procurement

(Unit: Thousand tons)

Year (July - June)	Production	Procurement	Items of Procurement		
			Aus	Aman	Boro
1977/78	12,764	539.1	1.6	500.8	37.1
1978/79	12,543	305.0	18.7	206.1	80.2
1979/80	12,150	224.9	-	175.6	49.3
1980/81	13,450	841.0	86.9	501.3	252.8

Source: Ministry of Food

Table II-2 Wheat Production and Procurement

(Unit: Thousand tons)

Year (July - June)	Production	Procurement
1977/78	343	11
1978/79	486	50
1979/80	1,200	123
1980/81	1,150	176

Source: Ministry of Food

Table II-3 Procurement of Foodgrains by District (Summary), 1974/75 - 1980/81
(in tons of rice equivalent) (Source: Ministry of Food)

Division/District	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81
Rajshahi	73,130	196,813	175,009	236,803	164,580	209,742	482,009
Dinajpur	34,213	79,233	75,160	89,458	65,859	61,205	190,455
Rangpur	16,252	41,990	32,675	51,419	20,185	37,499	82,315
Bogra	8,368	23,749	19,944	26,676	19,320	33,012	50,479
Rajshahi	13,686	43,999	42,352	65,200	54,658	58,671	122,793
Pabna	611	7,842	4,878	4,050	4,558	19,355	35,967
Khulna	33,428	87,535	44,653	111,259	40,776	44,287	108,035
Kushtia	1,066	8,878	3,079	2,188	3,106	9,177	10,279
Jessore	1,733	14,827	3,074	7,793	5,652	8,745	8,130
Khulna	10,511	21,778	10,789	15,016	2,118	6,865	25,914
Barisal	4,029	15,776	13,627	30,310	11,318	5,837	27,039
Patuakhali	16,089	26,276	14,084	55,952	18,582	13,663	36,673
Dacca	9,593	63,131	41,213	90,305	64,220	55,179	201,135
Jamalpur /a					3,771	8,520	35,076
Mymensingh	8,828	52,557	37,898	86,341	47,002	28,204	99,590
Tangail	202	2,551	365	1,550	1,938	4,788	22,869
Dacca	526	4,485	1,518	1,705	10,655	11,487	38,235
Faridpur	37	3,538	1,432	709	854	2,180	5,365
Chittagong	11,711	67,478	52,731	112,073	85,587	39,269	225,554
Sylhet	4,049	33,376	28,712	39,807	34,705	13,512	92,320
Comilla	455	13,326	5,953	19,016	25,868	16,372	41,725
Noakhali	2,627	11,587	9,818	22,746	8,592	2,577	45,844
Chittagong	3,950	8,270	7,128	25,884	12,575	4,417	29,561
Chittagong Hill Tracts	630	919	1,120	4,620	3,847	2,391	16,104
TOTAL	127,862	414,957	313,606	550,440	355,163	348,477	1,016,733

/a Jamalpur was a subdivision of Mymensingh until December 26, 1978.

Note: All grains procured are shown here expressed in terms of "rice equivalent"; i.e., 1 unit of wheat equals 1 unit of cleaned rice and 3 units of paddy procured equal 2 units of cleaned rice. (For 1974/75, a paddy/rice conversion ratio of 1 to 0.65 was used.)

Table II-4 Estimated Government Foodgrain Stocks (End of Month), 1972/73 - 1981/82

(Unit: Thousand tons)

Month	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
July	434	218	340	752	806	454	598	406	1,030	1,240
August	409	213	363	787	764	571	580	618	1,212	1,260
September	351	296	196	684	705	673	582	850	1,270	1,320
October	203	388	106	704	565	591	685	728	1,278	1,255
November	208	294	120	655	453	540	836	702	1,246	1,100
December	136	267	176	926	464	715	862	744	1,232	1,035
January	205	203	279	1,050	550	760	800	672	1,284	
February	225	171	252	1,046	559	696	713	529	1,237	
March	501	144	274	1,060	471	616	541	588	1,138	
April	491	149	311	844	371	566	412	512	1,134	
May	401	238	479	792	370	577	306	580	1,025	
June	297	214	749	823	376	591	209	779	1,229	
Average	322	233	304	845	538	613	594	642	1,193	
High	501	388	749	1,060	806	760	862	850	1,284	
Low	136	144	106	655	370	454	209	406	1,025	

Source : 1972/73 - 1976/77, World Food Programme, Dacca (adjustments for inventory and transit losses only at year-end);

1977/78 - 1981/82, IBRD (including monthly adjustment for losses).

Table II-5 Availability, Disposition and Stocks in the Foodgrain Distribution System

(Unit: Thousand tons)

		1977/78	1978/79	1979/80	1980/81	1981/82 (estimate)
Supply Availability	Opening Stocks	376	591	209	779	1,229
	Domestic Procurement	550	355	348	1,017	400
	Imports	1,653	1,146	2,739	1,061	1,233
	Total	2,579	2,092	3,296	2,857	2,862
Distribution	Rationing	1,847	1,796	2,402	1,522	1,950
	Losses	141	87	115	106	120
	Others	-	-	-	-	20
	Total	1,988	1,883	2,517	1,628	2,090
Closing Stocks		591	209	779	1,229	772

Remarks: 1. Source: Ministry of Food

2. Domestic procurement indicates the total one of rice and wheat.

Table II-6 Demand and Supply of Foodgrains

(Unit: One million tons)

	1977∿78	1978∿79	1979∿80	1980∿81
Population (Million persons)	83.7	85.7	87.7	90.0
Demand	13.2	13.5	13.9	14.2
Domestic Production				
Rice	12.8	12.5	12.1	13.4
Wheat	0.3	0.5	1.2	1.2
Total	13.1	13.0	13.9	14.2
(Actual)	11.8	11.7	12.0	13.1
Government Procurement				
(Domestic Production)	0.6	0.4	0.4	1.0
Government Rationing	1.9	1.8	2.4	1.5
Effective Supply	13.7	13.5	14.4	14.6
Consumption per capita	164 kg	158 kg	164 kg	162 kg

Source: Ministry of Food

Table II-7 Foodgrain Procurement Prices (1979 - 1981)

(Unit: Taka/Maund)

	Rice/Paddy							Wheat
	Aus		Aman			Boro		
	Paddy	Rice	Paddy	Coarse Rice	Medium Rice	Paddy	Rice	
Apr. 1979	80	128	80	128	130	80	128	86
May 1979	86	128	80	128	130	86	136	86
Nov. 1979	105	165	105	165	-	105	165	105
Nov. 1980	110	170	110	170	-	110	170	110
Dec. 1980	110	170	119	185	-	110	170	119

Remark: 1 maund ≒ 37.3 kg
Source: Ministry of Food

Table II-8 Rationing Issue and Sales Price for Foodgrains (1979 - 1981)

(Unit: Taka/Maund)

	Rice		Wheat	
	Wholesale Issure	Retail Sail	Wholesale Issure	Retail Sail
May 1979	117.00	120.00	87.00	90.00
May 1980	137.00	140.00	107.00	110.00
Nov. 1980	136.00	140.00	106.00	110.00
Apr. 1981	151.20	155.20	112.00	116.00
Dec. 1981	171.00	175.00	120.00	124.00

Source: Ministry of Food

Table II-9 Existing Capacity of Storages

(December 31, 1981)

(Unit: Thousand tons)

Division	District	C S D		L S D		Silo	
		Nos.	Capacity	Nos.	Capacity	Nos.	Capacity
Dacca	Dacca	3	67.75	27	49.0	1	50.5
	Mymensingh	1	22.0	38	65.25		
	Jamalpur			13	26.0		
	Tangail			11	24.5		
	Faridpur			24	43.0		
Chittagong	Chittagong	2	98.5	18	31.5	1	100.5
	Chittagong HillTracks			19	12.3		
	Sylhet			40	49.0		
	Noakhali			18	29.75		
	Comilla	1	10.0	29	46.8	1	50.5
Rajshahi	Rajshahi			37	62.93		
	Rangpur			31	46.64		
	Dinajpur			35	72.77		
	Bogra	1	31.0	15	34.16	1	25.0
	Pabna	1	32.5	14	30.0		
Khulna	Khulna	2	122.6	25	38.6		
	Kushtia			14	29.88		
	Patuakhali			17	28.5		
	Barisal	1	21.5	23	40.16		
	Jessore			24	36.29		
Total		12	406.35	472	797.0	4	226.5

Remarks: 1. Salt storages are not involved in the above table.

2. Source: Ministry of Food

Table II-10 Additional Storage Requirement, 1984 - 85
(By Districts)

(Unit: Thousand tons)

Division	Estimated Population in 1984 - 85 (Thousand persons)	Consumption Requirement in 1984 - 85 @15.5 oz per capita per day	Surplus (+) Deficit (-)	procured Storage Capacity (Existing + On-going)	Storage Need for Reserve Stock	Storage Need for Operation, Procurement by District	Total Storage Requirement	Storage Dificit	Ratio of Storage Deficit
	p	q	r	a	b	c	d = b + c	e = d - a	e/d x 100
Dacca Div.	30,850	4,871.00	+ 9.00	425.770	481.00	266.00	747.00	321.23	43.0 %
Dacca	11,600	1,832.00	- 787.00	191.990	240.00	25.00	265.00	73.01	27.6 %
Mymensingh	7,795	1,230.00	+ 719.00	108.730	70.00	150.00	220.00	111.27	50.6 %
Faridpur	5,6	892.00	- 247.00	64.420	95.00	5.00	100.00	35.58	35.6 %
Tangail	2,950	466.00	+ 164.00	30.140	36.00	46.00	82.00	51.86	63.2 %
Jamalpur	3,855	451.00	+ 160.00	30.490	40.00	40.00	80.00	49.51	61.9 %
Chittagong Div.	26,450	4,176.00	+ 29.00	556.700	477.00	156.00	633.00	76.30	12.1 %
Chittagong	6,450	1,018.00	- 173.00	281.480	258.00	32.00	290.00	8.52	2.9 %
Ctg.Hill Tracts	700	110.00	+ 10.00	16.300	16.00	10.00	26.00	9.70	37.3 %
Comilla	8,200	1,295.00	- 80.00	131.770	115.00	23.00	138.00	6.23	4.5 %
Noakhali	4,400	695.00	+ 165.00	50.950	40.00	36.00	76.00	25.05	33.0 %
Sylhet	6,700	1,058.00	+ 107.00	76.200	48.00	55.00	103.00	26.80	26.0 %
Rajshahi Div.	24,600	3,883.00	+1,462.00	454.560	266.00	368.00	634.00	179.44	28.3 %
Rajshahi	6,000	948.00	+ 87.00	88.252	88.00	20.00	108.00	19.75	18.3 %
Rangpur	7,700	1,215.00	+ 495.00	73.276	32.00	110.00	142.00	68.72	48.4 %
Dinajpur	3,700	584.00	+ 401.00	105.404	30.00	120.00	150.00	44.60	29.7 %
Bogra	3,200	505.00	+ 350.00	106.788	56.00	90.00	146.00	39.21	26.9 %
Pabna	4,000	631.00	+ 129.00	80.840	60.00	28.00	88.00	7.16	8.1 %
Khulna Div.	20,100	3,172.00	+ 398.00	421.846	352.00	138.00	490.00	68.15	13.9 %
Khulna	5,050	797.00	- 142.00	188.615	180.00	12.00	192.00	3.38	1.8 %
Jessore	4,750	750.00	+ 150.00	47.406	32.00	30.00	62.00	14.59	23.5 %
Kushtia	2,700	426.00	+ 49.00	36.040	32.00	16.00	48.00	11.96	24.9 %
Barisal	5,500	868.00	+ 172.00	93.005	64.00	40.00	104.00	11.00	10.6 %
Patuakhali	2,100	331.00	+ 169.00	56.780	44.00	40.00	84.00	27.22	32.4 %
Bangladesh	102,000	16,102.00	+1,898.00	1,858.876	1,576.00	928.00	2,504.00	645.12	

Source: Ministry of Food

Table II-11 Additional Storage Requirement and Existing Storage Capacity (By Districts)

(Unit: Thousand tons) December 1981

Division	District	Total Storage Requirement			Existing Storage Capacity				Additional Storage Requirement	
		Storage Need for reserve stock	Storage Need for operation, procurement	Total	Silo	CSD	LSD	Total	CSD	LSD
Dacca	Dacca	240	25	265	50.5	N 22.65 D 9.5 T 35.6	49.0	167.25	98	-
	Mymensingh	70	150	220		22.0	65.25	87.25	48	85
	Faridpur	95	5	100			43.0	43.0	(67)	-
	Tangail	36	46	82			24.5	24.5	(36)	22
	Jamalpur	40	40	80			26.0	26.0	(40)	14
Chittagong	Chittagong	258	32	290	100.5	HA 69.7 DC 28.8	31.5	230	60	-
	Chittagong Hill Tracts	16	10	26			12.3	12.3	(14)	-
	Comilla	115	23	138	50.5	CH 10.0	49.0	109.5	29	-
	Noakhali	40	36	76			29.75	29.75	(40)	6
	Sylhet	48	55	103			46.8	46.8	(48)	8
Rajshahi	Rajshahi	88	20	108			62.93	62.93	(45)	-
	Rangpur	32	110	140			46.64	46.64	(32)	63
	Dinajpur	30	120	150			72.77	72.77	(30)	47
	Bogra	56	90	146	25.0	S 31	34.16	90.56	-	56
	Pabna	60	28	88		MH 32.5	30	62.5	26	-
Khulna	Khulna	180	12	192		BO 67.1 MH 55.5	38.6	161.2	30	-
	Jessore	32	30	62			29.88	29.88	(32)	-
	Kushtia	32	16	48			28.5	28.5	(20)	-
	Barisal	64	40	104		21.5	40.16	61.66	42	-
	Patuakhali	44	40	84			36.29	36.29	(44)	4
Total		1,576	928	2,504	226.5	406.85	797.0	1,430.35		

Remarks: Total storage requirement is calculated in the Ministry of Food.

Table II-12 Storage Construction Programme as at April, 1982
(As far as studied in Project Proforma)

	IDA	ADB	EC	Netherland	CIDA	Total
DACCA DIV.	27,500	-	5,000	-	12,500	44,500
Dacca	2,000	-	-	-	7,500	9,500
Mymensingh	15,500	-	-	-	-	15,500
Faridpur	4,500	-	5,000	-	2,000	11,500
Tangail	1,000	-	-	-	2,500	3,500
Jamalpur	4,500	-	-	-	-	4,500
CHITTAGONG DIV.	17,500	-	27,000	12,000	4,500	61,000
Chittagong	-	-	5,000	-	4,500	9,500
Chittagong H.T.	-	-	-	-	-	-
Comilla	-	-	8,000	7,000	-	15,000
Noakhali	2,000	-	9,000	5,000	-	16,000
Sylhet	15,500	-	5,000	-	-	20,500
RAJSHAHI DIV.	111,000	-	13,000	-	-	124,000
Rajshahi	26,000	-	-	-	-	26,000
Rangpur	34,500	-	5,000	-	-	39,500
Dinajpur	39,500	-	-	-	-	39,500
Bogra	9,500	-	-	-	-	9,500
Pabna	1,500	-	8,000	-	-	9,500
KHULNA DIV.	8,000	58,500	5,000	-	3,500	75,000
Khulna	500	-	5,000	-	-	5,500
Jessore	4,500	-	-	-	3,500	8,000
Kushtia	3,000	-	-	-	-	3,000
Barisal	-	27,000	-	-	-	27,000
Patuakhali	-	31,500	-	-	-	31,500
Total	164,000	58,500	48,000	12,000	20,000	302,500

Table II-13 Storage Construction Programme as at February, 1981

Construction Projects Fully Funded and under Development

District	Salt Prog.	FRG	IDA	ADB	Neth.	Japan	GOB Crash	BWC	CIDA	EEC	Total
	(Tons)										
Dacca	10,240	3,000	1,500	-	-	1,000	15,500	-	7,500	-	38,740
Faridpur	1,920	-	6,500	-	-	-	18,000	-	2,000	5,000	33,420
Mymensingh/Jamalpur	5,120	-	27,500	-	-	-	23,000	10,500	-	-	66,120
Tangail	640	-	1,000	-	-	-	11,500	1,000	2,500	-	16,640
Division Total	17,920	3,000	36,500	-	-	1,000	68,000	11,500	12,000	5,000	154,920
Chittagong	17,280	-	-	-	-	5,000	14,000	4,000	4,500	5,000	49,780
Chittagong H.T.	-	-	-	-	-	-	9,000	-	-	-	9,000
Moakhali	3,200	-	-	-	5,000	-	10,000	-	-	9,000	27,200
Comilla	5,120	-	-	-	7,000	-	10,500	3,500	-	8,000	34,120
Sylhet	3,200	-	19,500	-	-	-	19,000	-	-	5,000	46,700
Division Total	28,800	-	19,500	-	12,000	5,000	62,500	7,500	4,500	27,000	166,800
Rajshahi	3,200	-	30,000	-	-	-	8,500	6,000	-	-	47,700
Dinajpur	1,920	-	30,500	-	-	-	1,500	5,000	-	-	38,920
Rangpur	3,840	-	24,000	-	-	-	5,000	3,000	-	5,000	40,840
Pabna	3,840	6,000	2,000	-	-	-	7,500	2,500	-	8,000	29,840
Bogra	5,120	-	13,500	-	-	11,000	1,000	8,500	-	-	39,120
Division Total	17,920	6,000	100,000	-	-	11,000	23,500	25,000	-	13,000	196,420
Khulna	7,040	5,000	1,500	-	-	2,000	16,000	-	-	5,000	36,540
Jessore	1,920	6,000	4,500	-	-	-	11,000	2,000	3,500	-	28,920
Kushtia	1,280	-	3,000	-	-	-	10,000	2,000	-	-	16,280
Barisal	3,840	-	-	33,500	-	-	5,000	-	-	-	42,340
Patuakhali	1,280	-	-	29,000	-	-	4,000	1,000	-	-	35,280
Division Total	15,360	11,000	9,000	62,500	-	2,000	46,000	5,000	3,500	5,000	159,360
GRAND TOTAL	80,000	20,000	165,000	62,500	12,000	19,000	200,000	49,000	20,000	50,000	677,500

Source : GOB - Ministry of Food

Table II-14 Goodgrain Storage Construction Project On-going under Foreign Aid to be Completed by June, 1983

(Source: Project Proforma)

(a) Total Project Cost / (b) Total Aid Cost	(c) Project Period	(d) Number of Proposed Storage / (e) District and Capacity	(f) Items of Whole Project	(g) Items under Foreign Aid
(1) IDA-credit Foodgrain Storage Construction Project (Revised Scheme)				
TK 683,093,000 ($ 53,952,000) revised on Jan. '82 TK 532,607,000 ($ 34,362,000) as original TK 108,975,000 ($ 5,736,000) revised on Jan. '82 TK 282,040,000 ($ 18,196,000) as original	Jul. 1, 78 Jun. 30, 83	173 LSDs (15 Districts) 500 tons x 330 storages = 165,000 tons District / tons / District / tons Jamalpur 4,500 / Faridpur 4,500 Mymensingh 15,500 / Tangail 1,000 Sylhet 15,500 / Pabna 1,500 Rajshahi 26,000 / Khulna 500 Bogra 9,500 / Jessore 4,500 Dinajpur 19,500 / Kushtia 3,000 Rangpur 14,500 / Noakhali 2,000 Dacca 2,000	1) Storage (165,000 tons) 2) Rehabilitation of Twin Nissen 3) Paddy driers 4) Residential building and ancillaries construction 5) Access road, water supply, staff quarters and other ancillaries 6) Electrification 7) Supply of equipments and machineries	1) Storage (165,000 tons) 2) Access road, water supply, staff quarters and other ancillaries 3) Supply of equipments and machineries 4) Consultance and training
(2) ADB-credit Foodgrain Storage Construction Project				
TK 176,500,000 ($ 11,387,000) TK 49,740,000 ($ 3,209,000)	Jul. 1, 79 Jun. 30, 83	10 LSDs (2 Districts) 500 tons x 125 storages = 62,500 tons District / tons Patuakhali 31,500 Barisal 27,000	1) Storage (62,500 tons) 2) Offices 3) Assistant Sub-Inspector quarters 4) Darwan sheds 5) Road, boundary wall, etc. 6) Electrification 7) Water supply and other facilities 8) Supply of equipments and machineries	1) Storage (62,500 tons) 2) Offices 3) Assistant Sub-Inspector quarters 4) Darwan sheds 5) Road, boundary wall, etc. 6) Supply of equipments and machineries 7) Consultant 8) Construction Engineer

(a) Total Project Cost / (b) Total Aid Cost	(c) Project Period	(d) Number of Proposed Storage / (e) District and Capacity	(f) Items of Whole Project	(g) Items under Foreign Aid
(3) EC-grant Foodgrain Storage Construction Project				
TK 179,413,000 ($ 11,575,000) TK 58,272,000 ($ 3,759,000)	Jan. 1, 81 Jun. 30, 83	9 LSDs (8 Districts) 500 tons x 96 storages = 48,000 tons District / tons / District / tons Rangpur 5,000 / Faridpur 5,000 Comilla 8,000 / Pabna 8,000 Noakhali 9,000 / Chittagong 5,000 Sylhet 5,000 / Khulna 5,000	1) Storage (50,000 tons) 2) Staff quarters 3) Roads, boundary wall, etc. 4) Electrification 5) Water and other facilities	1) Supply of construction materials 2) Consultance
(4) Netherlands grant Foodgrain Storage Construction Project (Revised Scheme)				
TK 45,000,000 ($ 2,903,000) revised on Jun. '81 TK 23,585,000 ($ 1,522,000) as original TK 44,000,000 ($ 2,839,000) to be available	Aug. 8, 79 Jun. 30, 83	17 LSDs (2 Districts) 500 tons x 28 storages = 14,000 tons District / tons Comilla 7,000 Noakhali 5,000 (Revised to 14,000 tons)	1) Storage (14,000 tons) 2) Staff quarters 3) Access road 4) Boundary wall and electrification	(Dutch grant is likely to be available.)
(5) CIDA (Canada)-grant Foodgrain Storage Construction Project				
TK 87,500,000 ($ 5,645,000) TK 8,500,000 ($ 548,000)	Jan. 1, 81 Jun. 30, 83	28 LSD s (5 Districts) 500 tons x 40 storages = 20,000 tons District / tons Dacca 7,500 Chittagong 4,500 Faridpur 2,000 Jessore 3,500 Tangail 2,500	1) Storage (20,000 tons) 2) Residentail building and ancillaries 3) Access Road 4) Darwan sheds 5) Compound wall 6) Supply of equipments and machineries	1) Consultance 2) Training for personnel and ancillary services

Table II-15 Foodgrain Storage Construction Method under Foreign Aid

		Consultant	Design and cost estimate	Construction engineering	Construction Contractor	Contract	Construction material	Construction period
IDA	Local	Engineering	PWD	PWD	Selected contractors through tender	Not turn-key	Procured	5 Years
	Foreign	Drying, procurement & storage	-	-	-	-	-	
ADB	Local	Engineering	PWD	PWD	Selected contractors through tender	Not turn-key	Procured	4 Years
	Foreign	Soil expert	-	Construction engineering	-	-	-	
EC	Local	Engineering	(Not known)	PWD	Selected contractors through tender	Not turn-key	Procured	2 Years and 6 months
	Foreign	Engineering	(Not known)	(Not known)	-	-	Imported	
Netherland	Local	Engineering	PWD	PWD	Selected contractors through tender	Not turn-key	Procured	Appr.2 Years and 10 months
	Foreign	-	-	-	-	-	-	
CIDA (Canada)	Local	Engineering	PWD	PWD	Selected contractors through tender	Not turn-key	Procured	2 Years and 6 months
	Foreign	Engineering	(Not known)	-	-	-	-	

Table II-16 Stock Position in Storages Constructed by Japanese Aid at Halishahar CSD on April, 1982

(Unit : Tons)

	No. 58 Storage	No. 59 Storage	No. 60 Storage	No. 61 Storage	No. 62 Storage	No. 63 Storage	No. 64 Storage	Total	Stock Ratio in Storage
Rice	792	441	353	164	636	322	877	3,585	95.7%
Paddy	-	-	-	-	-	-	-	-	-
Wheat	55	10	-	10	86	-	-	161	4.3%
Total	847	451	353	174	722	322	877	3,746	53.5% in Average

Table II-17 Stock Position in Storages Constructed by Japanese Aid at Tejgaon CSD on April 18, 1982

(Unit : Tons)

	No. 1 Storage	No. 2 Storage	No. 3 Storage	No. 4 Storage	No. 5 Storage	No. 6 Storage	Total	Stock Ratio in Storage
Rice							2,664	74%
L.B. (Local Boiled)	403	187	379	198	91	78	1,363	
N.B. (Nepal Boiled)	-	-	-	-	-	-	-	
B.B. (Burma Boiled)	-	16	-	-	17	17	50	
B.A. (Burma Atap)	81	97	32	35	98	-	342	
J.A. (Japan Atap)	-	17	32	50	99	52	250	
L.A. (Local Atap)	-	-	-	-	-	-	-	
K.A. (Pakistan Atap)	113	225	191	96	-	34	659	
Paddy	-	-	-	-	33	-	33	1.0%
Wheat	128	85	204	145	149	-	771	19.8%
Sugar	42	7	42	22	58	17	188	5.2%
Total	794	634	880	546	544	198	3,596	59.5% in Average

CHAPTER III: REQUESTED PROJECT SITES

1. Request by Government of Bangladesh

The number of project sites and storages to be constructed as requested by the Government of Bangladesh were 5 CSDs/LSD and 30 storages as shown in the following table, when the survey was started. However, it was confirmed that the ultimately requested numbers were 7 CSDs/LSD and 45 storages, as shown in the following table also (see Appendix II). This table shows the existing conditions of land acquisition and the priority of execution as determined by the Government of Bangladesh other than those.

The conditions of project sites in all CSDs that were finally requested were surveyed, but the Dinajpur LSD was excluded after discussion with the Ministry of Food since it was not a CSD.

Requested Sites and Nos of Storages

Requested Site (District)	Requested Nos. of Storages at start	Ultimate Requested Nos. of Storages	Conditions of Securing Construction Sites	Priority of Execution
Santahar CSD (Bogra)	6	6	Secured, but some obstacles to be removed	4
Halishahar CSD (Chittagong)	4	4	Secured	5
Mymensingh CSD (Mymensingh)	4	4	Secured, but some obstacle to be removed	1
Tejgaon CSD (Dacca)	each alternative 6	6	Existing storages to be demolished	2
Muladuli CSD (Pabna)		5	Secured	7
Dinajpur LSD (Dinajpur)	10	10	Partially secured, Others to be purchased	6
Boyra CSD (Khulna)	-	10	Existing storages to be demolished	3
Total	30	45	-	-

2. Outline of Requested Project Sites

The following outlines the descriptive human geographical review of the project sites requested by the Bangladesh government and as reviewed from the standpoint of food distribution and necessity of foodgrain storage expansion in each CSD or LSD. For location of the requested CSDs or a LSD, refer to the map provided in the title page of this report. Also refer to FIG. III-1 through 4 when reviews are made on the descriptive human geographical outline for production and consumption areas prospected for the end of 1984/85 fiscal year, and railway, road and river transportations.

(1) Mymensingh CSD, Mymensingh District

Being located in the northern part of the Dacca Division, the Mymensingh District is a large rice production area that is closest to Dacca, the capital. Since the population of this district is the third largest in the country, after Dacca and Comilla and ranking with Rangpur, the district has stable consumption in and around Mymensingh City and in addition it has the possibility of becoming a large consumption district depending on the production (refer to FIG. III-1). Mymensingh City is located on the cross point of the metre gauge railway that runs toward north from Chittagong through the eastern part of the country and the metre gauge railway that runs to north from Naranyanganj via Dacca and is an important physical distribution point (refer to FIG. III-2). However, the existing capacity of Mymensingh CSD is only 22,000 tons, which is quite insufficient for reserve and subsequent operation of the rice procured in the district, and receiving and rationing operation of imported food transported from the importing district. In addition, the neighboring district, Jamalpur, has no CSD, and when these points are taken into consideration, the requirement of additional storages becomes more and accordingly the necessity of expansion of storage capacity in the Mymensingh CSD is well recognized.

(2) Tejgaon CSD, Dacca District

While the Dacca District is the largest consumption district in the country, being populated with 11 million people (refer to FIG.III-1), the total capacity of the three CSDs located in the district to supply food in the district is only 69,000 tons. Especially, the Tejgaon CSD (capacity of 35,600 tons), located in the center of the city, must handle a large amount, as well as the variety, of cargo, and has a large number of licenced dealers, and unusual frequency of receipts and issues. Establishment of another CSD is the best solution to ease the situation, but it may be difficult to realize it immediately on account of difficulty in acquiring the land. Therefore, the only quick solution that can be taken is to reconstruct the existing old storages that are not suitable for food storing for efficient use of these storages.

(3) Boyra CSD, Khulna District

Khulna City is the center of the southwestern part of the country. Chalna, which is an international trade port, is nearby, and the railway starting in Khulna reaches the boundary with Nepal, running through Jessore and Santahar. Also, Khulna is connected with Rajshahi, Bogra and Rangpur through the metre gauge railway. Therefore, Khulha is an important point that can be considered as the center of the west region separated from the other part of the country by Jamna river (refer to FIG. III-2). The Boyra CSD located in the Khulna District is the depot for food supply in the district, as well as the depot for issue of food imported and landed in the Chalna port to the west region in the country. The existing capacity (67,100 tons) is enough for these operations, but most of the storages are of the TWIN-NISSEN type, which is not a suitable for food storing and also most of which are fairly old. Therefore urgent improvement of storing efficiency of them is necessary with these storages.

(4) Santahar CSD, Bogra District

Santahar City is located in the center of the Raishahi Division, the largest supply area of domestically produced food in Bangladesh (refer to FIG. III-1), and it occupies an important connection point of the railway that runs to the eastern region of the country via Boyra and Rangpur and the railway that runs northward from Khulna (refer to FIG. III-2). The Santahar CSD located in Santahar City fulfills two very important roles of collective storing of domestically produced food and distribution of imported food transported from Khulna. Since there is no CSD established in the area north from this CSD, its capacity of 31,000 tons is not sufficient and the capacity has to be expanded.

(5) Halishahar CSD, Cittagong District

Chittagong is the second largest city in Bangladesh. It has the largest international trading port in Bangladesh. and 60% of Bangladesh imported food are landed here. On the overland transportation, Chittagong is the starting point in the south of the railway connecting the eastern region and northwestern region of Bangladesh (refer to FIG. III-2). Together with the Dewanhat CSD, the Halishahar CSD located in Chittagong functions as an important point of food supply depot to the Chittagong District, as well as being a distributing depot of imported food to CSDs in the eastern region. The total storage capacity is 99,500 tons (67,700 tons of Halishahar CSD and 29,800 tons of Dewanhat CSD). When the 100,000 tons capacity of the silo is added, the capacity is on the level that is required normally. However, in order to manage concentrated cargo resulting from uneven arrival of vessels, which is a fate for the role of storages of imported articles, the capacity is still not enough and it has to be expanded.

(6) Muladuli CSD, Pabna District

While the Pabna District is principally a farming area located between Jamna and Ganges rivers in the center of country, it is a stable consumption district of food probably because of small foodgrain production resulting from frequent disasters affected

by drastic water level changes of large rivers between the rainy and dry seasons. The Muladuli CSD in this district functions on collection of foodgrains procured in the district and storing of foodgrains received from the other districts. Since LSDs in the surrounding areas have been expanded, urgent expansion of the Muladuli CSD does not seem necessary.

3. Utilizing Conditions of Storages in Surveyed CSDs

Table III-1 and 2 shows the stock condition of storages through a year (January through December, 1981) in the CSDs, where storages are requested to be constructed by the Government of Bangladesh. The utilizing conditions of these storages shown in the table are outlined in the following.

1) The annual utilizing ratio of the Tejgaon CSD storages is 5.2 indicating that utilizing frequency of this CSD is much higher than that of the other CSDs.

2) The annual utilizing ratio of the Muladuli CSD storages is 1.3, which is the lowest among all the CSDs surveyed this time.

3) The annual utilizing ratio of the Mymensingh CSD storages is 2.7, and that of the Santahar CSD and Halishahar CSD storages is 1.6.

Table III-3 shows the quantity of receipt and issue by stock item through a year, 1981, in the Mymensingh CSD, Tejgaon CSD and Muladuli CSD.

The stock position of CSDs at the time of survey is given in Table III-3. No investigation was conducted on CSDs other than those listed in the table. The storage utilizing conditions shown in this table can be summarized as follows:

a) In the Tejgaon CSD, even on condition that the stock position of items other than those listed in the table was not investigated, the stock ratio was 72.0%. It can be seen that, even though the survey was made in a season and year when the stock position is less than normal, the stock ratio were still high.

b) The stock ratio in the Muladuli CSD was only 6% and much unused spaces in these storages were found in actuality.

c) On the other CSDs, the stock ratio of the Halishahar CSD was 43.6% and Mymensingh CSD 26.9%.

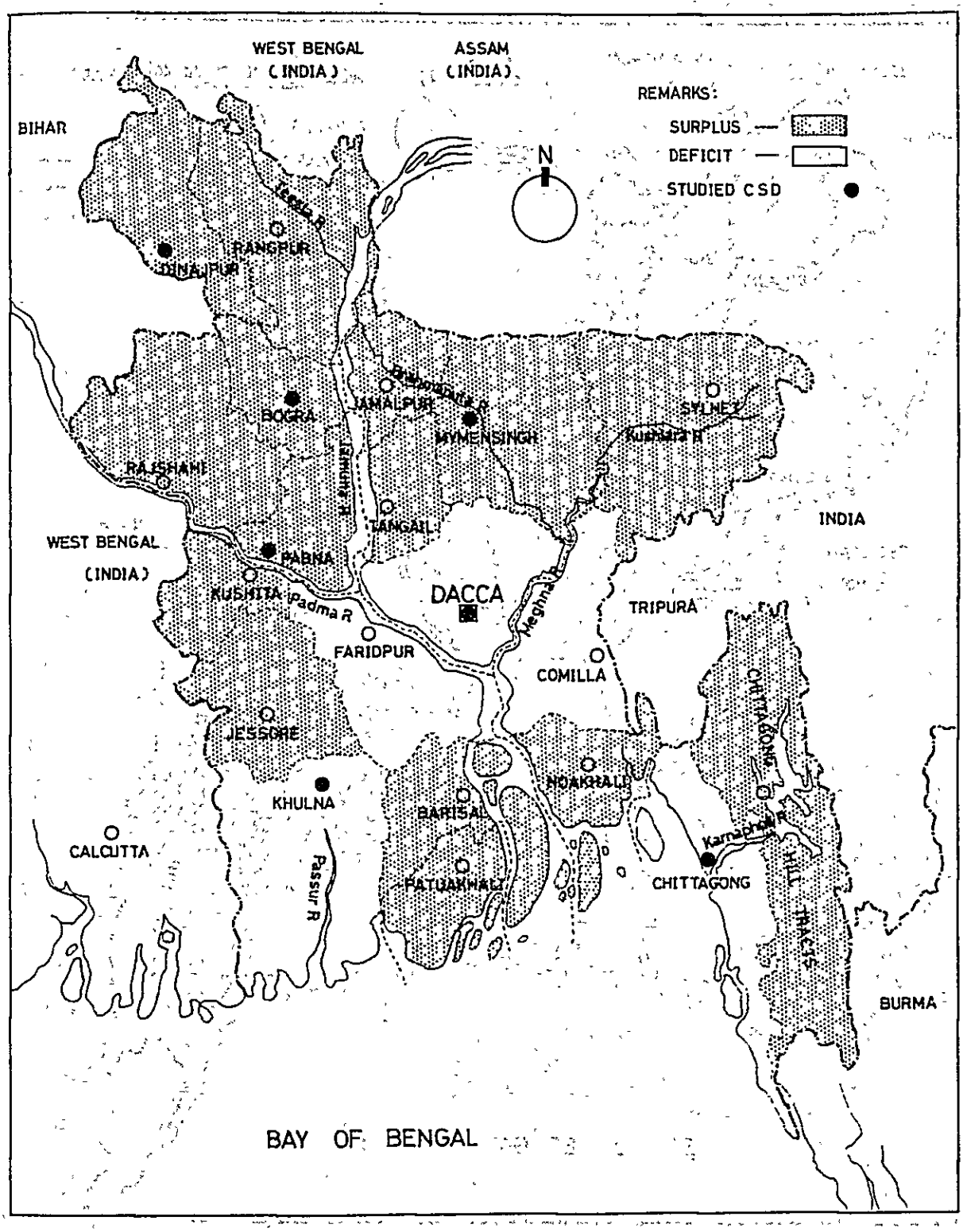


FIG. III-1 SURPLUS AND DEFICIT OF FOODGRAINS BY DISTRICTWISE (1984-85)

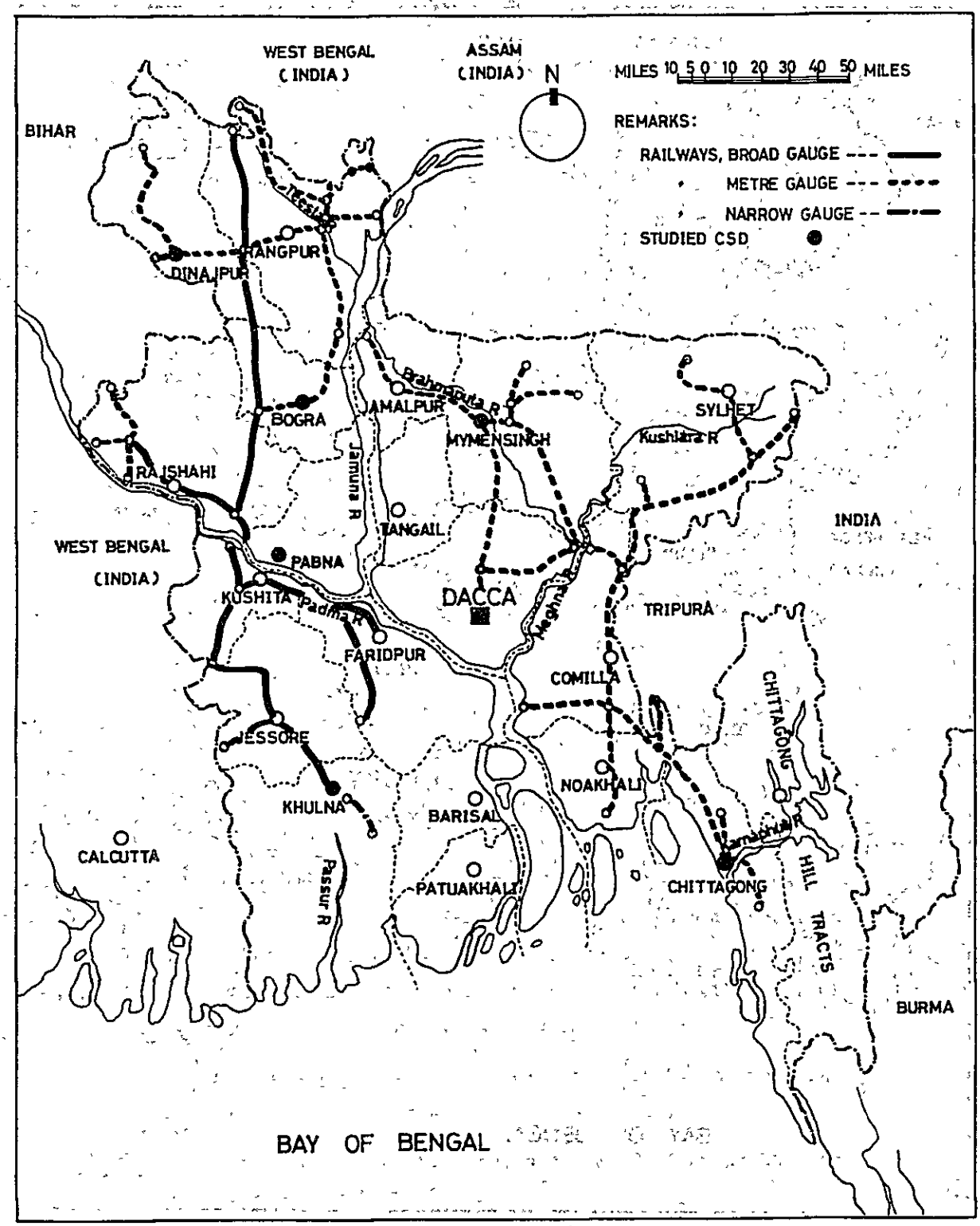


FIG. III-2 RAILWAY NETWORK

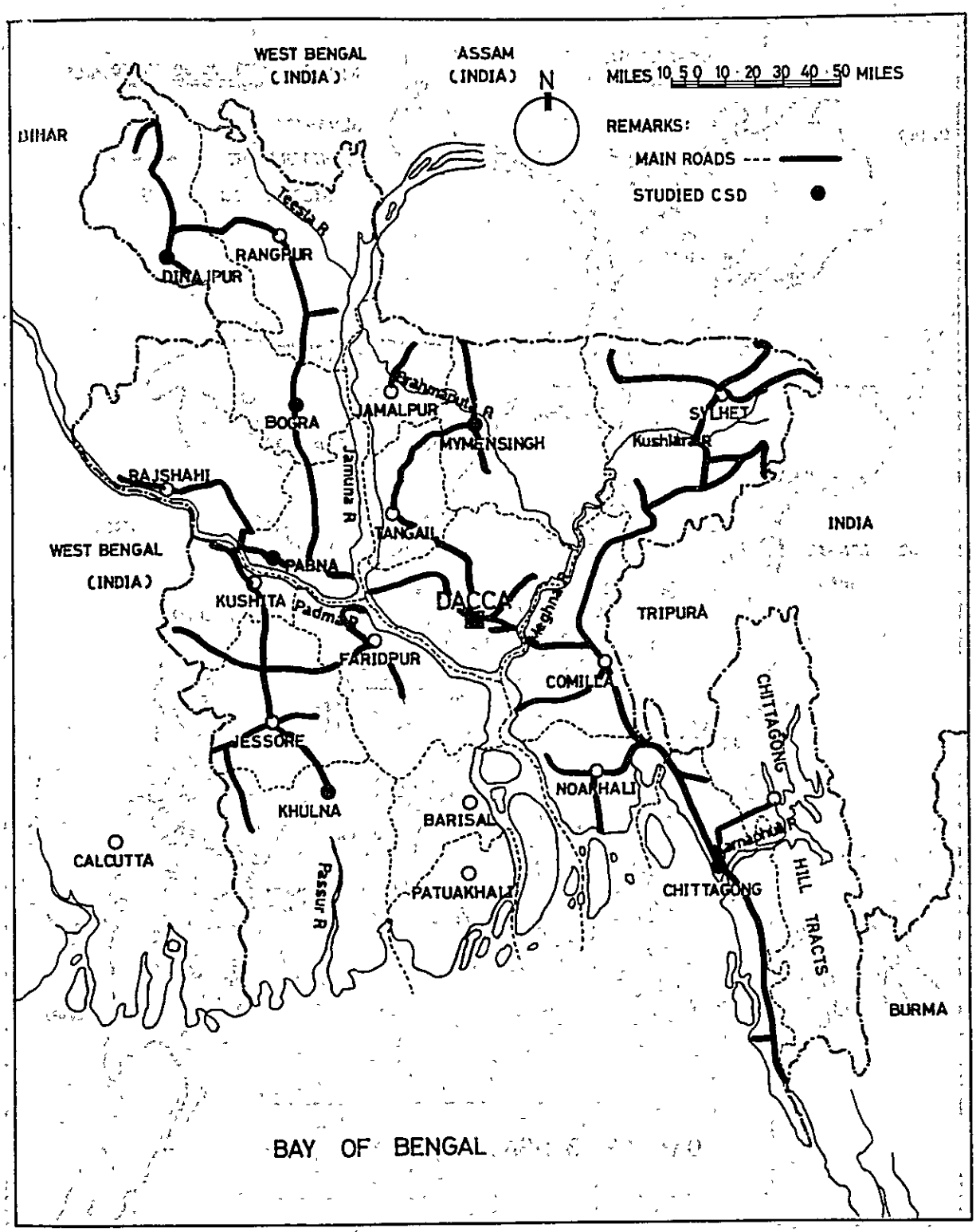


FIG. III-3 ROAD NETWORK

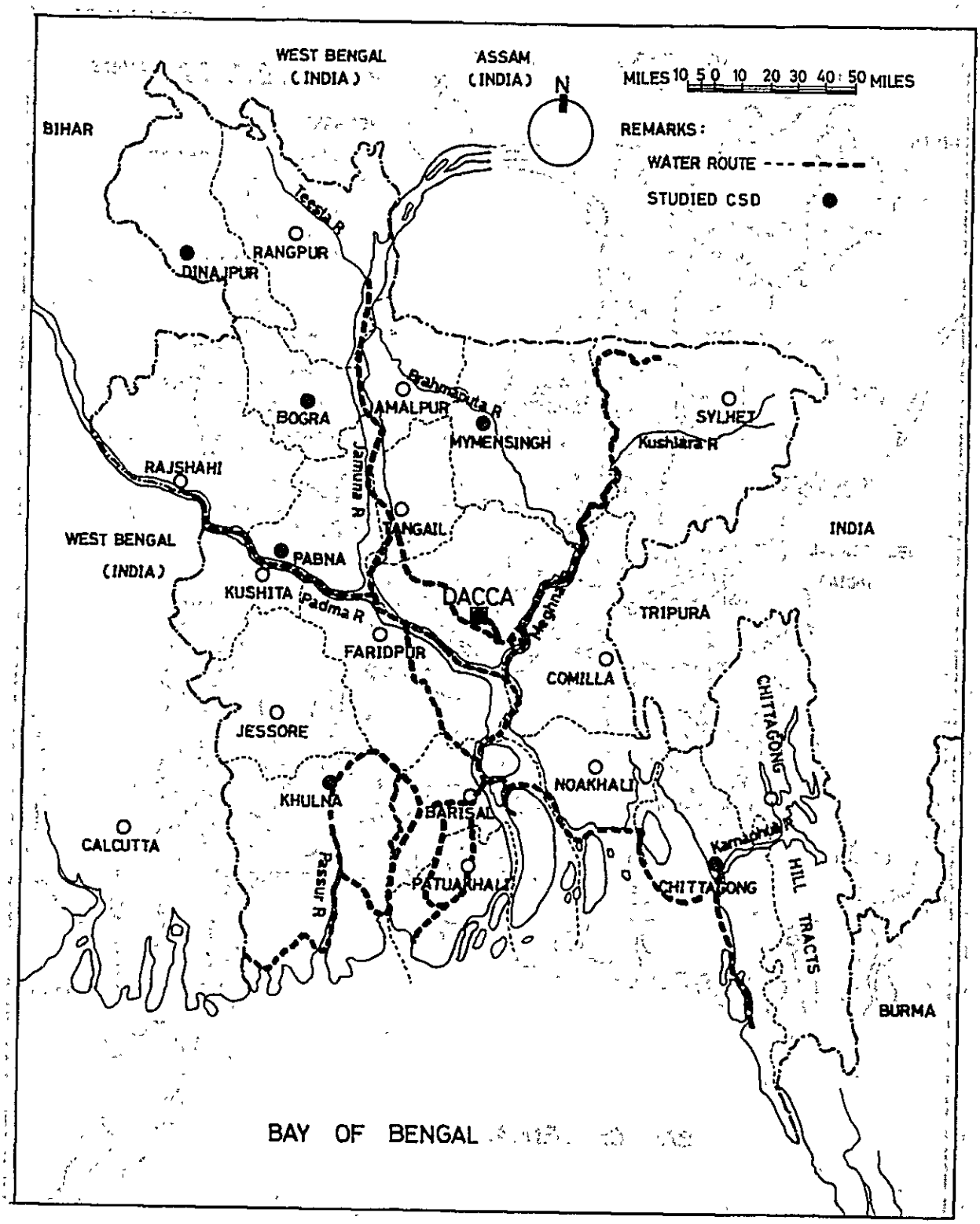


FIG. III-4 WATERWAYS

Table III-1 Existing Stocks in CSD and LSD Requested for Construction by Government of Bangladesh (Jan. - Dec. 1981)

(Unit: Tons)

	Name of CSD (District)	Storage Capacity	Itemized Stock (Jan. - Dec. 1982)							Storage Rotating Ratio (Year)	
			Rice	Paddy	Wheet	Sugar	Salt	Others	Total		
1	Mymensingh (Mymensign)	22,000	7,627	22,958	22,857	853	3,792	370	58,457	2.7	
2	Tejgaon (Dacca)	35,600	60,878	9,702	70,700		11,331	31,229 (incl. salt)	183,910	5.2	
3	Boyra (Khulna)	67,100	(not surveyed; no schedule at the beginning)								Storages in Khulna (Maheswarpasha; 55,500 tons; Boyra; 67,100 tons) handle 40 percent of all imported food grains(approx.0.9 million tons)
4	Santahar (Bogra)	31,000	3,228	25,294	19,242		2,268		50,032	1.6	
5	Halishahar (Chittagong)	69,700	39,018	1,280	71,316	1			111,615	1.6	
6	Muladuli (Pabna)	32,500	7,057	21,788	7,447	854	4,106	31,669	40,398	1.3	

Table III-2 Itemized Receipt & Issue and Closing Stock of Foodgrains

(Jan. - Dec. 1981 Unit: Tons)

Name of CSD	Items	Opening stock	Receipt	Issue	Closing stock	Remarks
Mymensingh CSD Storage Capacity: 22,000 tons	Rice	1,070	7,627	6,372	2,325	Note: As for Mymensingh CSD, the data from July 1980 to June 1981 is indicated.
	Paddy	2,943	22,958	12,592	13,309	
	Wheat	716	22,857	15,895	7,678	
	Sugar	2	853	852	3	
	Salt	132	3,792	3,821	103	
	Others	21	370	235	155	
	Total	4,884	58,457	39,767	23,573	Storage utilizing ratio 2.1 Freight utilizing ratio 2.8
Tejgaon CSD Storage Capacity: 35,600 tons	Rice	24,252	61,024	76,982	8,294	
	Paddy	116	9,999	9,379	736	
	Wheat	24,333	66,986	74,771	16,548	
	Salt	425	11,330	11,620	135	
	Others	1,168	29,740	28,652	2,256	
	Total	50,294	179,079	201,404	27,969	Storage utilizing ratio 5.03 Freight utilizing ratio 5.08
Muladuli CSD Storage Capacity: 32,500 tons	Rice	116	7,057	6,129	1,044	
	Paddy	17,017	21,784	34,870	3,931	
	Wheat	8,266	7,447	13,793	1,920	
	Salt	932	4,088	4,915	105	
	Others					
	Total	26,331	40,376	59,707	7,000	Storage utilizing ratio 1.24 Freight utilizing ratio 3.58

Table III-3 Stock Position of CSDs on Survey Date

(Unit: Tons)

C S D	Tejgaon CSD	Halishahar CSD	Muladuli CSD	Mymensign CSD
Date of Survey	Apr. 18, 1982	Apr. 17, 1982	Apr. 15, 1982	Apr. 13, 1982
Existing Capacity / Items	35,600	69,700	32,500	24,560
Rice	19,509	23,961	1,272	3,795
Paddy	1,723	1,710	71	1,674
Wheat	3,303	3,021	564	795
Salt	302	14	-	110
Sugar	782	-	-	64
Others (Butter, Palm oil, Sesame oil, Kaoliang)	-	-	-	173
Total	(25,619)	30,416	1,907	6,611
Stock ratio	(72.0%)	43.6%	6%	26.9%
Remarks	( ) excludes the other items		Salt (62 tons) and Jute bag (32,000 bags) stocked	